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# THE SCHOOL REVIEW

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## THE REORGANIZATION OF SECONDARY EDUCATION IN NEW HAMPSHIRE. I

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The reorganization of secondary education in New Hampshire has taken the form of (1) a readjustment in the content of the program of studies and (2) a changed conception of the teaching process. This reorganization is based upon the following facts and principles:

a) Of all the children who graduate from the elementary schools in the state 87.4 per cent enter the secondary schools and of these 55 per cent complete the course. The number entering the secondary school is rapidly increasing, and thus the necessity of providing a program of studies adapted to the needs of the masses of society is forced upon the high schools.

b) The high school must become in a real sense the people's school and provide educational opportunities for all the children of all the people adequate to their needs. To this end the program of studies must be in part built up and organized around the industries and activities which predominate in the community in which the school is located.

c) In New Hampshire the industries, chiefly agriculture and manufacturing, are of such a character that there is a demand for curricula in mechanic arts, textile arts, agriculture, domestic arts, and commerce.

d) The secondary school should not seek a high degree of specialization before about the age of seventeen. The physical and mental organism previous to this age is such that specialization is likely to produce arrested development. The aim should be the education of the individual and not narrow specific training, but such industries and activities as relate to the future life-work to which the natural aptitudes and inclinations of the individual point may be taken into the school and used as educative material.

e) Vocational education and liberal education must be given side by side in the same school. The education of every pupil must consist of both liberal and vocational elements. Every high school should have a liberal arts curriculum and one or more vocational curricula.

f) The chief end of education in a large sense is adaptability.

Upon the basis of these principles the reorganization of secondary education is going forward in New Hampshire. There are ninety secondary schools on the approved list of the department of public instruction. Of these, five now have complete curricula, four years in length, in mechanic arts, fifteen in agriculture, twenty in domestic arts, and thirty in commerce. One-half of all the secondary schools in the state have one or more of the industrial curricula. Nine schools have three; seven have two; twenty-nine have one. Every high school in the state with one exception has a liberal-arts curriculum. This high school has just been established this year in an agricultural community, has both domestic arts and agriculture, and will add liberal arts next year. In these curricula the pupil devotes about one-fourth of his time to vocational studies and about three-fourths to work which for him contributes to liberal education, in the belief that only so can we get the truly educated man. The industrial courses are all taught by teachers with special training for their special lines of work, such as graduation from an agricultural college for a high-school instructor in agriculture.

It is believed that one of the first essentials to successful school work of any kind is a well-organized course of study which shall be followed by the teaching force of the school, and an attempt has been made to develop such a course as the basis of the industrial work as well as for the other work.

It is the purpose of this article to describe the work of various schools whose programs are typical of what is being done in the state. Development is yet by no means complete; both organization and pedagogy are in a formative stage and the schools are far from a permanent basis.

### I. CURRICULUM IN AGRICULTURE

The curriculum in agriculture<sup>1</sup> which has been adopted by fifteen schools includes, in the first year, agronomy, farm carpentry, English, and arithmetic. The second-year studies are English, practical mathematics,<sup>2</sup> agronomy (completed), animal husbandry and dairying, and farm blacksmithing. The pupils of the third year take English, physics, animal husbandry and dairying (completed), horticulture, road-building, and forestry. The studies for the Senior year are English, American constitutional history, rural economy and farm management, geology, and physiography.

The work in agronomy begins with the study of soils, in the fall of the first year, and the class studies somewhat comprehensively the formation of soils, their classification, functions, physical properties, chemical properties, plant foods in the soil, and the effects of tillage upon soils. After the work on soils is completed, a study is made of the elementary principles of plant life, in the winter of the first year. This is applied botany and covers such topics as seeds, roots, the stem, leaves, the flower, and assimilation. The nature of plant food, its availability, the process of conversion into plant substance, and the different classes of foods are utilized as topics to give a broad view of the whole field of the subject of assimilation. During the winter term a study is made of field crops, with emphasis upon classification, the study of important

<sup>1</sup> This section and the following section on domestic arts are based on the *New Hampshire Standard Program of Study for Secondary Schools*, 1912 edition, which all the secondary schools use as the basis of their work; on the writer's experience for four years in supervising a school while it was undergoing reorganization; on his observations as inspector of high schools; on the reports of work of the schools, which are submitted annually to the department; and on the various New Hampshire state school reports.

<sup>2</sup> This is the name given to a course which includes (1) the algebra of the equation, (2) so much of geometry as relates to practical measurements, and (3) the elementary principles of surveying.

field crops, fertility of the soil, insects and blights and other enemies, and seed selection. In the early spring of this year the class devotes its attention to fertilizers and this work centers around the kinds, relative values, and composition of green manures, use, varieties, and value of barnyard manure, chemical fertilizers, complete fertilizers, indirect fertilizers, the mixing of fertilizers, methods of application, fertilizer laws and guaranties. For field and laboratory exercises in this part of the course the fixation of plant food by soil is noted, soils are tested for acidity, the loss by leaching of a given quantity of manure is ascertained, the effect of nitrogen, phosphoric acid, and potash on color and growth of plants is determined and described. In connection with the planting which is done in the spring a brief review is taken of the properties of soils and plant reproduction in general, with a further consideration of methods of propagation, preparation of seed bed, depth of planting various seeds, different methods employed with principles involved, and planting-time for various crops. As many different kinds of plowing and harrowing as possible are observed and described. The effects of good and poor drainage are noted with a comparison of deep and shallow draining. Cultivation is an important topic for instruction and is considered in connection with the crops which the student raises. In most of the schools crops are planted and cultivated at home during vacation, in addition to the school garden. The study of agronomy extends through the first year and into the fall of the second in order that the topic of harvesting may be included in the course. In the fall, in connection with the harvesting, the times for harvesting various crops, the principles which determine the time of harvest, methods of harvesting, curing, storing, and marketing receive due attention in class. At the close of the course in agronomy an important topic for consideration is the selection of seed, including a study of the time for selection, characteristics of good seed, plant-breeding, and the storage of seed.

In this course in agronomy about sixty field and laboratory exercises are carried out by pupils and teacher. A few are cited to show the nature of this work: (1) determination of effect of water on soil temperature; (2) germination tests for corn and at least six

other crops, seeds selected to be used in spring planting; (3) practical work in preparing a piece of ground for crop either at home or at school. Each student carries on one or more extensive projects in connection with the course. This is considered one of the most important parts of the work. It is held, however, that the best work is obtained only when the class as a whole works along the lines of a systematically planned course of study and carries on project work in connection with it.

The programs of the secondary schools which have introduced agriculture provide for two years of farm mechanics, so called, which consists of a year of woodworking and farm carpentry in the first year and a year of forging and farm blacksmithing in the second year. The boys have daily work at the bench and forge throughout the two years and make useful articles of wood and iron. They learn how to manage the fire, to bend, shape, and weld both iron and steel. Typical articles which they make are chain links, irons for sleds and wagons, whiffle-tree irons, wagon bodies, hot-bed sashes, and screen doors. The boys not only learn to make things of wood and iron but they acquire something of the skill of the carpenter and the blacksmith and learn enough of the structure and construction of farm buildings, implements, and machinery to enable them to make buildings for themselves and to repair machinery and tools.

In the second year of the agricultural curriculum animal husbandry and dairying are studied. This course begins with a brief study of a few of the main principles of elementary zoölogy which brings out the underlying facts and principles of animal life. This includes cells and their different forms and purposes, essential organs found in all the higher forms, respiration, circulation, digestion, nutrition, sense organs, the nervous system, and reproduction. The principle of heredity is explained as well as the evolutionary process, the principle of natural selection, and the phenomena of parasitism. Following the study of elementary zoölogy a study is made of types and breeds of the common domestic animals of the farm. Breeding is made a special subject of study and the topics to which attention is given are: aims in breeding, heredity, variation, atavism, prepotency, fecundity, line-breeding,

cross-breeding, pedigree, and the reading and writing of pedigrees. Breeding as practiced by local farmers is studied for results. Feeds and feeding are regarded as very important, and a comprehensive survey of this field is given by studying the relation between the plant and animal world, digestion and assimilation, classification of foods, rations, including selecting and compounding and figuring cost. Practice is given in determining amounts of nutrients in quantities of feeds. Samples of all cattle feeds in the locality are collected and studied. Prices of different feeds are obtained and the amounts of nutrients which can be purchased for a given figure are computed. The cost of keeping different animals for a year at current prices is determined.

Dairying is studied somewhat intensively and the main topics are: milk composition and secretion and properties; the Babcock test with extended exercises in testing different cows and herds; the lactometer and its use; conditions essential to the production of good milk; care and treatment of milk; butter- and cheese-making. A great deal of laboratory work is given in connection with this work. Nearly all schools have adequate dairy laboratories for this purpose.

Most of the schools have a good course in poultry raising which is deemed very important. The place of birds in the economy of nature and of man is noted. A review is taken of the general principles of breeds, breeding, and feeding as previously studied, and these topics are specifically related to poultry. The study of embryology, egg production, incubation, care of young, the construction and needs of the poultry-house, and insects and diseases gives the pupil a broad view of this subject. This field is particularly fertile for laboratory work and a good deal of it is done. Specimens of as many breeds as possible are examined and described. A good many exercises are given in figuring poultry rations. Local poultrymen are visited whenever possible and their practices observed. Eggs taken from under a sitting hen at various stages afford a means of studying embryological growth.

The work in horticulture in the third year is devoted to three large fields of study: (1) vegetable-growing; (2) fruit-growing; and (3) economic insects.

The study of vegetable-growing begins with a review of plant structure, germination, plant physiology, pollination, and reproduction, which were studied in agronomy. The elementary principles of soil physics and the chemistry of plant life are studied, after which the pupils give attention to garden soils and fertilizers, garden tools, the construction of hot beds and cold frames, seed selection, and the study of typical vegetable crops. Botanical relationships and characteristics are studied. The preparation of the seed bed and soil and fertilizer requirements are considered important topics. A large group of laboratory exercises and projects is made use of in this course. In studying fruit-growing the students study such topics as soils adapted to fruit-growing, climatic conditions, tillage and fertilizers, classes and varieties of fruits, selecting of stock and planting, diseases and insect enemies, and harvesting. For project work each pupil takes an old tree or vine to get into good bearing condition. The study of economic insects leads to a knowledge of the relation of insects to higher orders, relation to plant life, the common orders, the essential facts of insect structure, a typical life-history, beneficial effects, injurious insects, and distribution and control. Numerous laboratory exercises here as elsewhere are carried out.

Road-building in the third year includes a study and comparison of the various kinds of roads such as dirt, gravel, macadam, and telford. The essentials of a good road, grades, solidity, and water-shedding characteristics are considered. Road material and principles of construction receive attention. Field work along the line of observation of construction of state highways in the vicinity is an important part of the course.

Under the head of forestry a study is made of New Hampshire forest types, life-history, associates, and enemies of characteristic trees in each type. Some of the main topics which form the basis of the instruction are forest seeding and planting, management of the farm forest and government forests, conservative lumbering, relation to stream flow, and general rural conditions. Practical field observation and lectures by experienced foresters and lumbermen are planned as a part of this course.

The Senior year in agriculture is devoted to (1) rural economy and (2) farm management.



In connection with rural economy, farm accounting, book-keeping, and business methods receive a good deal of emphasis and the special forms of bookkeeping needed by the farmer are taught. The pupils are taught to keep debit and credit accounts for the household, dairy, poultry, the various fields, and live stock. The importance of keeping debit and credit accounts with each productive animal is pointed out. Capital, labor, production, and marketing are studied in a thoroughgoing way.

Farm management is considered during the last part of the Senior year. Crops and methods of cropping are studied systematically; the purpose of drainage, kinds of drains, and cost are taken up in a concrete way. Water supply, sewer location, and plumbing and the essential features of sanitation offer an opportunity for further study. The principles of construction, materials, and location of farm buildings are excellent topics for class study and laboratory work. Many different kinds of farm machinery are examined and studied. The principles of law which concern the daily life of the farmer are touched upon.

The aim of this course, as of the other industrial courses, is educational more than vocational. The purpose is more largely to produce educated men than specific skill in farming, although much of the latter will follow.

## II. CURRICULUM IN DOMESTIC ARTS

The curriculum in domestic arts which twenty schools have adopted follows the lines laid down in the following pages. The work of the first year is English, a foreign language, music and art, elementary cooking, dressmaking from the design standpoint, and embroidery. English, foreign language, music, and art are continued in the second year with the addition of household sanitation and hygiene and household mechanical appliances. The third year has for its studies English, a foreign language, music and art, advanced physiology and hygiene, and the elements of nursing. In the fourth year the girls study English, a foreign language, music and art, cooking from the analytical point of view, household economics, household design and decoration, and American constitutional history.

The first work which is taken up in domestic arts is elementary cooking and in this are learned the principles and management of the various cooking appliances such as coal, wood, gas, gasoline, and kerosene ranges, fireless cookers, and electric heaters. The principles, use, and care of the various kitchen appliances, hot water, refrigerator, utensils, cupboards, and pantry are used as material for class study. In connection with serving, the care of the dining-room, the table and appurtenances, and the decoration of the room are taught. Menus are designed for various needs and occasions. The girls in this course make a special study of food-stuffs—the various cuts of meat, fish, eggs, milk, butter and cheese, vegetables, cereals, and fruits. A large amount of practice in cooking simple articles of diet is given, including the cooking of vegetables, meats, fish, soups, bread and cake, pastry, and preserves. Many projects in the form of dinners and lunches are available here. This field is especially rich in opportunities for mathematical computation, as in figuring the cost of the menu for a given dinner.

If sewing has been taught in the elementary schools, as is now quite common, the work in the first year of the high school is dressmaking and millinery. This course covers such lines of work as machine sewing, drafting with use of pattern, fitting and hanging of garments, designing and drafting of patterns, study of textiles, hygiene in relation to wearing apparel, suitability of apparel in relation to use and income, line and color adaptations, and computation of costs. The projects carried out here are numerous and range from a simple work-bag to the designing and trimming of a spring hat and the making of a summer dress.

The course in household mechanical appliances in the second year puts the emphasis on the scientific principles involved in a large number of household appliances. There is hardly a mechanical appliance used in the home which does not illustrate some scientific principle, and this course is of the nature of applied physics. The value of this for girls is obvious. They see the practical application of the principles which they study in those things with which they come in contact in their daily lives. The educational value of work of this kind is greater than in the case of a study of those

things which are entirely remote from their everyday experiences. The principles involved in the various heating appliances first receive attention. A few of the topics will indicate the trend and content of the course: the nature of combustion, the chemical principle of oxidation, the chemical nature of fuels, the elementary principles of heat, the cooking-range, electric heating, principles underlying heating and ventilating the house, construction and principles of the hot-air furnace, construction and principles of hot-water and steam heating-systems for dwellings, study of detailed scheme of plumbing of typical residence, the elementary principles of hydraulics, the water-piping of a residence, elementary principles of electricity and their application to electric lighting, electric heating, and the electric meter, gas lighting. Power in the household is a special topic for consideration and introduces a brief survey of elementary mechanics, the water motor, and the electric motor. The ice-cream freezer and the refrigerator illustrate the principle of latent heat. A course of this kind will eventually replace the formal, pure-science course in physics for girls who are not going to college. In such a course as this the educational value aspect is clearly evident. It is believed that this is one of the most valuable fields of study in the entire domestic-arts course.

The last half of the second year in the domestic-arts curriculum is devoted to household sanitation and hygiene. This is another of the very valuable courses which the girls take. Those who take this course, by their increased intelligence along the line of the proper sanitation and hygiene of the home, have a powerful defense against disease, a large part of which is due to lack of intelligence along hygienic and sanitary lines. The field which this course covers embraces the germ theory of disease, the elementary principles of bacteriology; a thorough study of ventilation, the water supply, milk supply, and the proper care of milk; food supply, including adulteration, with special reference to economic and sanitary considerations; drugs and medicines, with great emphasis on the danger of drugs taken promiscuously; refuse, with attention to it as a breeding-place for bacteria; personal hygiene; study of the house and furniture from the point of view of sanita-

tion and hygiene. This last topic includes the need of light in all rooms, upholstering as a factor in household sanitation, and the use of iron, glass, and tiling in the construction of good furniture.

The third-year work in advanced physiology and hygiene needs no extended description except to say that it is strictly of the same grade as the physics or chemistry which is taught for college admission with reference to laboratory work, notebooks, and great emphasis upon the applications to personal and public hygiene.

The course in nursing deserves especial mention. It is, of course, not intended that trained nurses shall be produced in a high-school course like this. Great stress is laid upon cleanliness from a surgical point of view. A review of the elements of bacteriology in an elementary way is taken. All forms of emergencies, such as cuts, bruises, burns, fractures, dislocations, asphyxia from gas, drowning, fainting, poisoning, are studied in a practical way. The care of minor injuries is taught in a practical and elementary manner. The simple facts concerning temperature, pulse, and respiration receive attention. The nursing of children and aged people is given a good deal of emphasis. The care of the sick and cooking for the sick-room furnish an excellent opportunity to give instruction which is rational and practical for girls of secondary-school age. This course will add largely to the intelligence and efficiency of the future wife and mother.

The advanced cooking of the Senior year is taught from a very different point of view from that of the elementary cooking of the first year. In the advanced cooking and dietaries the more scientific aspects are studied. This work centers around the study of food values, the chemistry and biology of cooking, and the preparation of economical dietaries. The diet of the sick-room receives considerable attention. The various food constituents are studied from a scientific point of view. The bacteriology of foods furnishes a valuable field for study in this year. The consideration of the nutritive values of foods furnishes problems of especial interest and value to girls at this stage of their education. All of the staple foods are studied from the point of view of chemical composition, economy, place in diet, and methods of preparation. A great deal of canning and preserving is done and the whole matter is

considered from a bacteriological standpoint. A great many laboratory exercises in the form of cooking exercises are given in this course.

The second line of work in this year is called household economics. It centers around two lines of work: (1) Household accounts: household bookkeeping is of great importance for the future housewife and involves a good deal of practical mathematics of the kind which will function in after-life. The use of the check-book, the keeping of the accounts of the household, and the general money relations of the household form the basis of the work in this field. (2) Marketing: the following quotation from the last report of the department of public instruction concerning one school gives the essential feature of the work in marketing:

Each girl has been assigned an imaginary family of three, with a moderate income. Using daily market prices, furniture and clothes catalogues, and other data from real life as the basis, she has been expected to do imaginary buying and bookkeeping, under the oversight of an instructor, and to carry the family through. Doubtless the pupil would find real life very different from imaginary life, but nobody can doubt that in this way she secures an insight into the conditions under which most young housekeepers must live of incalculable value.<sup>1</sup>

The spirit and content of the course in household design and decoration in the Senior year may be seen from the following statement of work covered which is a part of the report of work submitted to the state education office by one school:

Evolution of the house; development of the American house; house plans; study and criticism of various house plans in textbook and magazines; completion by each pupil of one of these plans and design for second-floor plan of some house; plan by each girl of first and second floors of main building; construction of the house; choice of site and style of building to suit place and purpose; consideration of cellars; plan of cellars known to pupils; principles of house decoration and furnishing; consideration of division of space, good lines, appropriateness, and harmony of color; practical experience gained by selecting furniture for a window in a furniture store; one recitation period each week in latter part of term given to discussion of minor details of house-keeping with this general question in mind: "How can *we* protect or add to the beauty, convenience, and comfort of our home?" To each girl was assigned some special topic.<sup>2</sup>

<sup>1</sup> Morrison, *New Hampshire School Report*, 1911-12, p. 230.

<sup>2</sup> *Ibid.*, pp. 230-31.